LIGHT-TRANSMISSIVE CONDUCTIVE MATERIAL, DISPERSION-TYPE ELECTROLUMINESCENT ELEMENT AND PANEL SWITCH USING THE SAME

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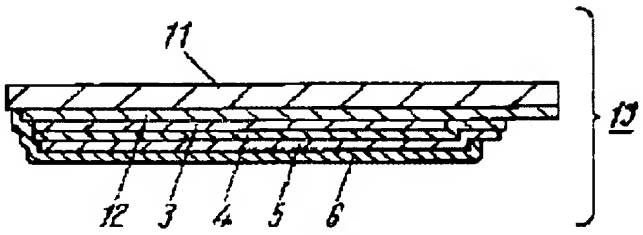
Abstract of **JP11273874**

PROBLEM TO BE SOLVED: To provide a low-priced EL element which does not need moisture-proofing work and with small changes in the resistance value of a light- transmissive electrode layer due to moisture, in the case of an EL element used as a backlight, etc., in the display part or the operation part of various electronic apparatuses. SOLUTION: A light-transmissive resin having light-transmissive conductive powder dispersed therein and including needle-form crystal powder of tin indium oxide, is made into a less hygroscopic pheoxy resin or a mixed resin of a phenoxy resin and an epoxy resin, or into a fluororubber containing polyfluorovinylidene, by the use of this a light-transmissive electrode layer 12 is printed/formed on an insulation film 11, then an illuminant layer 3, a dielectric layer 4, etc., are printed and formed thereon in a successively superimposedly, and thereby a low-priced EL element can be obtained which does not need moisture-proofing work and is small in changes in the resistance value of the light-transmissive electrode layer due to moisture.



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CLAIMS

[Claim(s)]
[Claim 1] The insulating film of light transmission nature, and the light transmission nature electrode layer by which printing formation was carried out with the light transmission nature resin which distributed light transmission nature electric conduction powder in the whole surface or the predetermined part of this insulating film one side, While it consists of the emitter layer by which printing formation was carried out one by one in piles on the light transmission nature electrode layer and a dielectric layer, and a back plate layer and the light transmission nature electric conduction powder of a light transmission nature electrode layer contains the needle crystal powder of indium oxide tin The distributed electroluminescent element which used the principal component of light transmission nature resin as the mixed resin of phenoxy resin or phenoxy resin, and an epoxy resin.
[Claim 2] The distributed electroluminescent element made into the fluororubber which replaces the light transmission nature resin of a light transmission nature electrode layer with light transmission nature resin according to claim 1, and contains polyvinylidene fluoride.
[Claim 3] The distributed electroluminescent element according to claim 1 or 2 which covered the light transmission nature electric conduction powder of a light transmission nature electrode layer with at least one coupling agent of a silane or titanate, and aluminum.
[Claim 4] The light transmission nature electrical conducting material which distributed the indium oxide tin of needle crystal as light transmission nature electric conduction powder to the light transmission nature resin which used the fluororubber containing the mixed resin or polyvinylidene fluoride of phenoxy resin or phenoxy resin, and an epoxy resin as the principal component.
[Claim 5] The panel switch which performs electric attachment and detachment of a switching circuit through the above-mentioned component by arranging a switching circuit for an actuation object caudad to the upper part, and pressing an actuation object while arranging an insulating film side on the top face and arranging a back plate layer side for the distributed electroluminescent element of any one publication of claim 1-3 on the inferior surface of tongue.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the distributed electroluminescent element (it is hereafter indicated as an EL element) and panel switch using the light transmission nature electrical conducting material and this which are used for the display and control unit of various electronic equipment as a back light etc.
[0002]
[Description of the Prior Art] What was equipped with the back light for illumination behind a display panel or LCD increases so that discernment and actuation of a display may be possible also in darkness, and many EL elements have come to be used as the object for back lights as diversification of various electronic equipment progresses in recent years.
[0003] Such a conventional EL element is explained using drawing 4 . Drawing 4 is the sectional view of the conventional EL element, and it is the transparent insulating film with which 1 has the flexibility of polyethylene terephthalate etc. in this drawing. All over this one side, by the spatter or the electron beam method Indium oxide tin The light transmission nature electrode layer 2 which consists of (indicating it as ITO hereafter) is formed. The emitter layer 3 which made high dielectric resin, such as a fluororubber and cyanoresin, distribute the zinc sulfide used as the base material of luminescence on this furthermore, Printing formation of the insulating layers 6, such as the dielectric layer 4 which made high dielectric resin distribute barium titanate etc. similarly, the back plate layer 5 of the silver connected to the dielectric layer 4 or a carbon resin system, an epoxy resin, and polyester resin, is carried out in piles one by one, and the EL element is constituted.
[0004] If electronic equipment is equipped with the EL element of the above configurations and an electrical potential difference is impressed from the circuit (not shown) of electronic equipment between the light transmission nature electrode layer 2 of an EL element, and the back plate layer 5, since an EL element will drive and emit light and this light will illuminate a display panel, LCD, etc. of electronic equipment from back, even when dark in a perimeter, discernment of a display or a control unit can be performed clearly.
[0005]
[Problem(s) to be Solved by the Invention] However, since the light transmission nature electrode layer 2 which consists of an ITO metal powder was formed all over one side of the insulating film 1 by the spatter or the electron beam method in the above-mentioned conventional EL element, while this processing took time amount and becoming cost quantity, when it continued making light emit in high humidity, electric-field corrosion arose in the light transmission nature electrode layer 2, and the technical problem that the part which does not emit light partially occurred occurred.
[0006] Moreover, although distributing light transmission nature electric conduction powder to light transmission nature resin, screen-stenciling this conductive paste on an insulating film, and forming a light transmission nature electrode layer is performed as the formation approach of other light transmission nature electrode layers as indicated by JP,8-78164,A In order to prevent the rise of the sheet resistance under the high humidity environment of a light transmission nature electrode layer, wrapping and laminating an EL element with a fluorine film etc. needed to process it for moisture proof.
[0007] And the resistance rise by the humidity of the light transmission nature electrode layer using this light transmission nature resin That light transmission nature resin carries out moisture absorption swelling with moisture, and since light transmission nature electric conduction powder has the hydroxyl group so much on the front face, Although it is because the loose contact resistance increases [contact of the light transmission nature electric conduction powder distributed in light transmission nature resin when the amount of adsorption of a water molecule increased gradually] unless it will make it an elevated temperature and will dry, once it adsorbs a water molecule Since it was necessary to perform the above moisture-proof processings in spite of forming the light transmission nature electrode layer by cheap printing compared with a spatter or an electron beam method, this took time amount and the technical problem that it will become cost quantity occurred.
[0008] This invention solves such a conventional technical problem, and a light transmission nature electrical conducting material with few changes in resistance of the light transmission nature electrode layer by moisture and moisture-proof processing are unnecessary, and it aims at offering a cheap EL element and a cheap panel switch.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention makes the light transmission nature resin which distributed the light transmission nature electric conduction powder containing the needle crystal powder of indium oxide tin the fluororubber containing the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or polyvinylidene fluoride, and carries out printing formation of the light transmission nature electrode layer using this.
[0010] Thereby, a light transmission nature electrical conducting material with few changes in resistance of the light transmission nature electrode layer by moisture and moisture-proof processing are unnecessary, and can obtain a cheap EL element and a cheap panel switch.
[0011]
[Embodiment of the Invention] The light transmission nature electrode layer by which printing formation of the invention of this invention according to claim 1 was carried out with the insulating film of light transmission nature, and the light transmission nature resin which distributed light transmission nature electric conduction powder in the whole surface or the predetermined part of this

insulating film one side, While it consists of the emitter layer by which printing formation was carried out one by one in piles on the light transmission nature electrode layer and a dielectric layer, and a back plate layer and the light transmission nature electric conduction powder of a light transmission nature electrode layer contains the needle crystal powder of indium oxide tin Since it considers as the distributed electroluminescent element which used the principal component of light transmission nature resin as the mixed resin of phenoxy resin or phenoxy resin, and an epoxy resin and printing formation of the light transmission nature electrode layer is carried out with resin, By using light transmission nature resin as the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, and carrying out printing formation of the light transmission nature electrode layer using this, while the EL element which has flexibility is obtained It has the operation with few [moisture-proof processing is unnecessary and] changes in resistance of the light transmission nature electrode layer by moisture that a cheap EL element can be obtained.

[0012] Invention according to claim 2 replaces the light transmission nature resin of a light transmission nature electrode layer with light transmission nature resin according to claim 1, considers as the fluororubber containing polyvinylidene fluoride, and hygroscopicity is using still smaller polyvinylidene fluoride as light transmission nature resin, and it has an operation that an EL element with still few changes in resistance of the light transmission nature electrode layer by moisture is obtained.

[0013] In invention according to claim 1 or 2, invention according to claim 3 has an operation that an EL element with few changes in resistance of the light transmission nature electrode layer by moisture is obtained, in order that the light transmission nature electric conduction powder of a light transmission nature electrode layer may be covered with at least one coupling agent of a silane or titanate, and aluminum and adsorption of a water molecule into light transmission nature electric conduction powder may decrease by these coupling agents.

[0014] Invention according to claim 4 the fluororubber containing the mixed resin or polyvinylidene fluoride of phenoxy resin or phenoxy resin, and an epoxy resin to the light transmission nature resin used as the principal component It considers as the light transmission nature electrical conducting material which distributed the indium oxide tin of needle crystal as light transmission nature electric conduction powder. By making the principal component of light transmission nature resin into the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or the fluororubber in which hygroscopicity contains still smaller polyvinylidene fluoride It has an operation that a light transmission nature electrical conducting material with few changes in resistance by moisture can be obtained.

[0015] While an insulating film side is arranged on the top face and it arranges a back plate layer side on the inferior surface of tongue, invention according to claim 5 the distributed electroluminescent element of any one publication of claim 1-3 By arranging a switching circuit for an actuation object caudad to the upper part, and pressing an actuation object It considers as the panel switch which performs electric attachment and detachment of a switching circuit through the above-mentioned component, and since the switching circuit is operated through this using the EL element excellent in flexibility, it has an operation that the panel switch excellent in operability can be obtained.

[0016] Hereafter, the gestalt of operation of this invention is explained using drawing 1 - drawing 3 . In addition, the same sign is given to the part of the same configuration as the configuration explained by the term of a Prior art, and detailed explanation is omitted.

[0017] (Gestalt 1 of operation) drawing 1 is the sectional view of the EL element by the gestalt of operation of the 1st of this invention, and 11 is needlelike in this drawing to the light transmission nature resin which is the transparent insulating film which has flexibility, such as polyethylene terephthalate, polyimide, Pori Sall John, and a polycarbonate, and has flexibility on this one side — the conductive paste which the light transmission nature electric conduction powder containing ITO distributed is printed, and the light transmission nature electrode layer 12 is formed.

[0018] And the emitter layer 3 which made high dielectric resin, such as a fluororubber and cyanoresin, distribute the zinc sulfide used as the base material of luminescence on this light transmission nature electrode layer 12, The insulating layers 6, such as the dielectric layer 4 which made high dielectric resin distribute barium titanate etc. similarly, the back plate layer 5 of the silver connected to the dielectric layer 4 or a carbon resin system, an epoxy resin, and polyester resin It is the same as that of the case of a Prior art that printing formation is carried out in piles one by one, and EL element 13 is constituted.

[0019] Moreover, although it is the same as that of the case of a Prior art that EL element 13 drives and emits light and this light illuminates a display panel, LCD, etc. of electronic equipment from back if electronic equipment is equipped with this EL element 13 and an electrical potential difference is impressed between the light transmission nature electrode layer 12 of EL element 13, and the back plate layer 5 The light transmission nature electrode layer 12 is formed by printing this conductive paste, using the fluororubber containing the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or polyvinylidene fluoride as light transmission nature resin.

[0020] The concrete manufacture approach and property of the above EL elements are explained. First, after having printed each conductive paste by the gestalt of this operation shown in (Table 1), and the conventional conductive paste for a comparison on the 350-mesh stainless steel screen with the predetermined pattern, drying them for 30 minutes at 155 degrees C and forming the light transmission nature electrode layer 12 on the polyethylene terephthalate (PET) film of 0.1mm of stock thickness, the following printings were performed in piles one by one on this.

[0021]

[Table 1]

	ペースト配合成分	wt%
実施例1	フェノキシ樹脂（東都化成株式会社製 フェノトートYP-50） 硬化剤（京都エレックス社製 G8009B） 導電粉（住友金属鉱山株式会社製SCP－X） イソホロン	21.4 2.1 44.6 31.9
実施例2	フェノキシ樹脂（東都化成株式会社製 フェノトートYP-50） エポキシ樹脂（油化シェル株式会社製 #828） 硬化剤（京都エレックス社製 G8009B） 導電粉（住友金属鉱山株式会社製SCP－X） イソホロン	19.6 3.2 2.9 45.3 29.0
実施例3	フェノキシ樹脂（東都化成株式会社製 フェノトートYP-50） エポキシ樹脂（油化シェル株式会社製 #828） 硬化剤（京都エレックス社製 G8009B） 導電粉（住友金属鉱山株式会社製SCP－X） イソホロン	10.8 10.9 3.7 45.8 28.8
実施例4	フッ素ゴム（デュポン社製 GLT） 硬化剤（ジクミルパーオキサイド） 導電粉(住友金属鉱山株式会社製 SCP－X) 2－エトキシエトキシエタノール	16.6 3.2 48.3 31.9
実施例5	フッ素ゴム（ダイキン工業株式会社製ダイエルG-902） 硬化剤（ジクミルパーオキサイド） 導電粉(住友金属鉱山株式会社製 SCP－X) 2－エトキシエトキシエタノール	14.8 2.8 52.6 29.8
比較例1	熱可塑性アクリル樹脂（三菱レーヨン株式会社製 LR-637） 導電粉(住友金属鉱山株式会社製 SCP－X) イソホロン	12.8 45.4 41.8
比較例2	熱硬化性アクリル樹脂（三菱レーヨン株式会社製 SE-192） 導電粉(住友金属鉱山株式会社製 SCP－X) イソホロン	14.5 51.4 34.1

[0022] The emitter paste which distributed 85 % of the weight (OSRAM SYLVANIA TYPE30) of zinc sulfide fluorescent substances to 15 % of the weight (Du Pont Viton A) of fluororubbers dissolved in 2-ethoxy ethoxy ethanol was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 100 degrees C, and the emitter layer 3 was formed.
[0023] Next, the dielectric paste which distributed 78 % of the weight (BT[by Sakai chemistry incorporated company]- 05) of barium titanate powder to 22 % of the weight (Du Pont Viton A) of fluororubbers dissolved in 2-ethoxy ethoxy ethanol was printed on the 100-mesh stainless steel screen with the predetermined pattern, was dried on the same conditions as the emitter layer 3, and the dielectric layer 4 was formed.
[0024] Then, carbon paste (DW[by Toyobo Co., Ltd.]- 250 H) was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 155 degrees C, and the back plate layer 5 was formed.
[0025] Finally, the insulating resist (XB[by FUJIKURA KASEI CO., LTD.]- 804) was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 155 degrees C, and the insulating layer 6 was formed.
[0026] Under the high humidity environment of 40-degree-C95%RH, 500 hours and after leaving it for 1000 hours, change of the sheet resistance (kohm/**) of a light transmission nature electrode layer and the brightness (Cd/m2) in 100V400Hz was evaluated for the EL element by the gestalt of this operation manufactured as mentioned above, and the conventional EL element for a comparison.
[0027] The result of this characterization is explained using (Table 2).
[0028]
[Table 2]

	初期		500時間後		1000時間後	
	輝度	シート抵抗値	輝度	シート抵抗値	輝度	シート抵抗値
実施例1	69.8	0.68	52.3	1.36	41.5	1.45
実施例2	66.9	0.39	51.6	1.69	40.9	2.12
実施例3	69.2	0.34	52.1	1.95	40.1	2.36
実施例4	65.7	1.92	49.2	2.35	38.5	2.46
実施例5	68.4	2.52	48.6	3.47	37.7	3.49
比較例1	69.5	0.43	22.7	23.7	発光せず	360
比較例2	67.2	0.45	18.2	49.8	発光せず	768

（シート抵抗値は単位：kΩ／□，輝度は単位：Cd／m²で示す）

[0029] The examples 1 and 2 of a comparison which carried out printing formation a light transmission nature electrode layer, using acrylic resin as light transmission nature resin so that clearly from (Table 2) As opposed to sheet resistance rising, brightness deteriorating and going with the passage of time, and sheet resistance becoming several 100kohms /, and ** in 1000 hours, and stopping emitting light Although brightness is carrying out the abbreviation reduction by half of the examples 1-5 which carried out printing formation of the light transmission nature electrode layer also after 1000 hours, using phenoxy resin, an epoxy resin, and a fluororubber as light transmission nature resin, sheet resistance is several kohms / **, and what has a few change in resistance by moisture.
[0030] Moreover, the examples 4 and 5 which carried out printing formation of the light transmission nature electrode layer, using inside or a fluororubber as light transmission nature resin show the sheet resistance in which change of sheet resistance was excellent with small 3 premiums also after 1000 hours.
[0031] Thus, according to the gestalt of this operation, even if it does not perform moisture-proof processing of the lamination by the film etc., a cheap EL element with few changes in resistance of the light transmission nature electrode layer by moisture can be obtained.
[0032] (Gestalt 2 of operation) After performing coupling processing of (Table 3) into the light transmission nature electric conduction powder (SCP-X by Sumitomo Metal Mining Co., Ltd.) of the example 2 of the gestalt 1 of operation, the EL element which carried out printing formation of a light transmission nature electrode layer, an emitter layer, a dielectric layer, etc. using the conductive paste of

the same combination was manufactured into it, and the same characterization as the gestalt 1 of operation was performed into it.
[0033]
[Table 3]

	カップリング処理
実施例6	シランカップリング剤（信越化学工業株式会社製 KBM-403）2％のアセトン溶液に浸漬した後、120℃で1時間乾燥。
実施例7	チタネートカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄKR 44）2％のメタノール溶液に浸漬した後、120℃で1時間乾燥。
実施例8	アルミニウムカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄAL-M）2％のメタノール溶液に浸漬した後、120℃で1時間乾燥。

[0034] This result is explained using (Table 4).
[0035]
[Table 4]

	初期		500時間後		1000時間後	
	輝度	シート抵抗値	輝度	シート抵抗値	輝度	シート抵抗値
実施例6	66.3	0.56	51.8	0.99	41.2	1.05
実施例7	66.1	0.48	51.4	1.23	40.8	1.26
実施例8	66.6	0.62	50.8	1.33	40.8	1.42

（シート抵抗値は単位：kΩ／□、輝度は単位：Cd／㎡で示す）

[0036] In (Table 2), about 2 times and a change in resistance are sharply improved for the sheet resistance of the example 2 used as about 5 or more times to the first stage in 1000 hours so that clearly from (Table 4).
[0037] Thus, according to the gestalt of this operation, an extensive improvement of a change in resistance can be aimed at by covering light transmission nature electric conduction powder with at least one coupling agent of a silane or titanate, and aluminum.
[0038] In addition, although how to make distribute this light transmission nature electric conduction powder in light transmission nature resin, and carry out printing formation of the light transmission nature electrode layer using this conductive paste was explained after immersing light transmission nature electric conduction powder in the coupling solution and making a coupling agent cover with the above explanation beforehand Even if it adds a coupling agent and carries out printing formation of the light transmission nature electrode layer using this conductive paste into the solution which dissolved the light transmission nature resin which distributed light transmission nature electric conduction powder by the organic solvent, of course, it is possible to make light transmission nature electric conduction powder cover a coupling agent.
[0039] Drawing 2 is the sectional view of the panel switch by the gestalt of operation of the 3rd of this invention, and is set to this drawing. (Gestalt 3 of operation) needlelike to the light transmission nature resin which has flexibility on one side of the insulating film 11 — the light transmission nature electrode layer 12 which the light transmission nature electric conduction powder containing ITO distributed — It is the same as that of the case of the gestalt 1 of operation that printing formation of the emitter layer 3, a dielectric layer 4, the back plate layer 5, and the insulating layer 6 is carried out in piles one by one, and EL element 13 is constituted.
[0040] and to the insulating film 11 side of the EL element 13 upper part The actuation object 14 which consists of India rubber, insulating resin, etc. of light transmission nature is arranged. To the downward back plate layer 5 side The upper wiring substrate 15 which carried out printing formation of the traveling contact 15B on the inferior surface of tongue of insulating film 15A, The bottom wiring substrate 16 which carried out printing formation of the stationary-contact 16B counters the top face of insulating film 16A through a spacer 17, a switching circuit 18 is constituted, a case 19 covers these and the panel switch 20 is constituted.
[0041] In the above configuration, if an electrical potential difference is impressed between the light transmission nature electrode layer 12 of EL element 13, and the back plate layer 5, EL element 13 drives and emits light, and since control unit 14A of actuation object 14 top face which this light projected from two or more holes of a case 19 is illuminated from an inferior surface of tongue, even when dark in a perimeter, the location of control unit 14A and a display can check clearly.
[0042] Moreover, if press actuation of the control unit 14A of the actuation object 14 is carried out to a lower part, height 14B at the bottom will sag the upper wiring substrate 15 through EL element 13. If electrical installation of traveling contact 15B of the upper wiring substrate 15 and stationary-contact 16B of the bottom wiring substrate 16 is performed and the thrust of the actuation object 14 is removed, it is constituted so that traveling contact 15B may separate from stationary-contact 16B and may return to the OFF condition of drawing 2 according to the elastic return force of the upper wiring substrate 15.
[0043] Thus, according to the gestalt of this operation, the actuation object 14 is arranged to the insulating film 11 side of the EL element 13 upper part, a switching circuit 18 is arranged to the downward back plate layer 5 side, a panel switch 20 is constituted, and since the switching circuit 18 is operated through EL element 13 excellent in flexibility, the panel switch excellent in the operability which does not degrade an actuation feel can be obtained.
[0044] Moreover, if it replaces with the upper wiring substrate 15 which carried out printing formation of the traveling contact 15B and printing formation of the traveling contact is carried out on the inferior surface of tongue of EL element 13, the number of component parts can be reduced and a still cheaper panel switch can be obtained.
[0045] In addition, although the above explanation explained the switching circuit 18 arranged at the back plate layer 5 side of EL element 13 lower part as the so-called membrane switch which traveling contact 15B of the upper wiring substrate 15 and stationary-contact 16B of the bottom wiring substrate 16 were made to counter The wiring substrate 21 with which stationary contacts 21A and 21B were formed in the top face as shown in drawing 3 . The dome-like traveling contact 22 made from an elastic metallic thin plate laid on stationary-contact 21B of the wiring substrate 21 constitutes a switching circuit 23. By height 14B of actuation object 14 inferior surface of tongue pressing the central top-most-vertices section of the dome-like traveling contact 22 through EL element 13, and the dome-like traveling contact's 22 being reversed, and contacting stationary-contact 21A of the wiring substrate 21 Of course also as a panel switch 24 which performs electric attachment and detachment of stationary contacts 21A and 21B, operation of this invention is possible.
[0046]
[Effect of the Invention] According to this invention, a light transmission nature electrical conducting material with few changes in

resistance of the light transmission nature electrode layer by moisture and the advantageous effectiveness that moisture-proof processing is unnecessary and a cheap EL element and a cheap panel switch can be obtained are acquired as mentioned above.

[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Field of the Invention] This invention relates to the distributed electroluminescent element (it is hereafter indicated as an EL element) and panel switch using the light transmission nature electrical conducting material and this which are used for the display and control unit of various electronic equipment as a back light etc.

[Translation done.]

NOTICES *

PRIOR ART

[Description of the Prior Art] What was equipped with the back light for illumination behind a display panel or LCD increases so that discernment and actuation of a display may be possible also in darkness, and many EL elements have come to be used as the object for back lights as diversification of various electronic equipment progresses in recent years.
[0003] Such a conventional EL element is explained using drawing 4 . Drawing 4 is the sectional view of the conventional EL element, and it is the transparent insulating film with which 1 has the flexibility of polyethylene terephthalate etc. in this drawing. All over this one side, by the spatter or the electron beam method Indium oxide tin The light transmission nature electrode layer 2 which consists of (indicating it as ITO hereafter) is formed. The emitter layer 3 which made high dielectric resin, such as a fluororubber and cyanoresin, distribute the zinc sulfide used as the base material of luminescence on this furthermore, Printing formation of the insulating layers 6, such as the dielectric layer 4 which made high dielectric resin distribute barium titanate etc. similarly, the back plate layer 5 of the silver connected to the dielectric layer 4 or a carbon resin system, an epoxy resin, and polyester resin, is carried out in piles one by one, and the EL element is constituted.
[0004] If electronic equipment is equipped with the EL element of the above configurations and an electrical potential difference is impressed from the circuit (not shown) of electronic equipment between the light transmission nature electrode layer 2 of an EL element, and the back plate layer 5, since an EL element will drive and emit light and this light will illuminate a display panel, LCD, etc. of electronic equipment from back, even when dark in a perimeter, discernment of a display or a control unit can be performed clearly.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, a light transmission nature electrical conducting material with few changes in resistance of the light transmission nature electrode layer by moisture and the advantageous effectiveness that moisture-proof processing is unnecessary and a cheap EL element and a cheap panel switch can be obtained are acquired as mentioned above.

[Translation done.]

NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since the light transmission nature electrode layer 2 which consists of an ITO metal powder was formed all over one side of the insulating film 1 by the spatter or the electron beam method in the above-mentioned conventional EL element, while this processing took time amount and becoming cost quantity, when it continued making light emit in high humidity, electric-field corrosion arose in the light transmission nature electrode layer 2, and the technical problem that the part which does not emit light partially occurred occurred.
[0006] Moreover, although distributing light transmission nature electric conduction powder to light transmission nature resin, screen-stenciling this conductive paste on an insulating film, and forming a light transmission nature electrode layer is performed as the formation approach of other light transmission nature electrode layers as indicated by JP,8-78164,A In order to prevent the rise of the sheet resistance under the high humidity environment of a light transmission nature electrode layer, wrapping and laminating an EL element with a fluorine film etc. needed to process it for moisture proof.
[0007] And the resistance rise by the humidity of the light transmission nature electrode layer using this light transmission nature resin That light transmission nature resin carries out moisture absorption swelling with moisture, and since light transmission nature electric conduction powder has the hydroxyl group so much on the front face, Although it is because the loose contact resistance increases [contact of the light transmission nature electric conduction powder distributed in light transmission nature resin when the amount of adsorption of a water molecule increased gradually] unless it will make it an elevated temperature and will dry, once it adsorbs a water molecule Since it was necessary to perform the above moisture-proof processings in spite of forming the light transmission nature electrode layer by cheap printing compared with a spatter or an electron beam method, this took time amount and the technical problem that it will become cost quantity occurred.
[0008] This invention solves such a conventional technical problem, and a light transmission nature electrical conducting material with few changes in resistance of the light transmission nature electrode layer by moisture and moisture-proof processing are unnecessary, and it aims at offering a cheap EL element and a cheap panel switch.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention makes the light transmission nature resin which distributed the light transmission nature electric conduction powder containing the needle crystal powder of indium oxide tin the fluororubber containing the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or polyvinylidene fluoride, and carries out printing formation of the light transmission nature electrode layer using this.
[0010] Thereby, a light transmission nature electrical conducting material with few changes in resistance of the light transmission nature electrode layer by moisture and moisture-proof processing are unnecessary, and can obtain a cheap EL element and a cheap panel switch.
[0011]
[Embodiment of the Invention] The light transmission nature electrode layer by which printing formation of the invention of this invention according to claim 1 was carried out with the insulating film of light transmission nature, and the light transmission nature resin which distributed light transmission nature electric conduction powder in the whole surface or the predetermined part of this insulating film one side, While it consists of the emitter layer by which printing formation was carried out one by one in piles on the light transmission nature electrode layer and a dielectric layer, and a back plate layer and the light transmission nature electric conduction powder of a light transmission nature electrode layer contains the needle crystal powder of indium oxide tin Since it considers as the distributed electroluminescent element which used the principal component of light transmission nature resin as the mixed resin of phenoxy resin or phenoxy resin, and an epoxy resin and printing formation of the light transmission nature electrode layer is carried out with resin, By using light transmission nature resin as the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, and carrying out printing formation of the light transmission nature electrode layer using this, while the EL element which has flexibility is obtained It has the operation with few [moisture-proof processing is unnecessary and] changes in resistance of the light transmission nature electrode layer by moisture that a cheap EL element can be obtained.
[0012] Invention according to claim 2 replaces the light transmission nature resin of a light transmission nature electrode layer with light transmission nature resin according to claim 1, considers as the fluororubber containing polyvinylidene fluoride, and hygroscopicity is using still smaller polyvinylidene fluoride as light transmission nature resin, and it has an operation that an EL element with still few changes in resistance of the light transmission nature electrode layer by moisture is obtained.
[0013] In invention according to claim 1 or 2, invention according to claim 3 has an operation that an EL element with few changes in resistance of the light transmission nature electrode layer by moisture is obtained, in order that the light transmission nature electric conduction powder of a light transmission nature electrode layer may be covered with at least one coupling agent of a silane or titanate, and aluminum and adsorption of a water molecule into light transmission nature electric conduction powder may decrease by these coupling agents.
[0014] Invention according to claim 4 the fluororubber containing the mixed resin or polyvinylidene fluoride of phenoxy resin or phenoxy resin, and an epoxy resin to the light transmission nature resin used as the principal component It considers as the light transmission nature electrical conducting material which distributed the indium oxide tin of needle crystal as light transmission nature electric conduction powder. By making the principal component of light transmission nature resin into the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or the fluororubber in which hygroscopicity contains still smaller polyvinylidene fluoride It has an operation that a light transmission nature electrical conducting material with few changes in resistance by moisture can be obtained.
[0015] While an insulating film side is arranged on the top face and it arranges a back plate layer side on the inferior surface of tongue, invention according to claim 5 the distributed electroluminescent element of any one publication of claim 1-3 By arranging a switching circuit for an actuation object caudad to the upper part, and pressing an actuation object It considers as the panel switch which performs electric attachment and detachment of a switching circuit through the above-mentioned component, and since the switching circuit is operated through this using the EL element excellent in flexibility, it has an operation that the panel switch excellent in operability can be obtained.
[0016] Hereafter, the gestalt of operation of this invention is explained using drawing 1 - drawing 3 . In addition, the same sign is given to the part of the same configuration as the configuration explained by the term of a Prior art, and detailed explanation is omitted.
[0017] (Gestalt 1 of operation) drawing 1 is the sectional view of the EL element by the gestalt of operation of the 1st of this invention, and 11 is needlelike in this drawing to the light transmission nature resin which is the transparent insulating film which has flexibility, such as polyethylene terephthalate, polyimide, Pori Sall John, and a polycarbonate, and has flexibility on this one side — the conductive paste which the light transmission nature electric conduction powder containing ITO distributed is printed, and the light transmission nature electrode layer 12 is formed.
[0018] And the emitter layer 3 which made high dielectric resin, such as a fluororubber and cyanoresin, distribute the zinc sulfide used as the base material of luminescence on this light transmission nature electrode layer 12, The insulating layers 6, such as the dielectric layer 4 which made high dielectric resin distribute barium titanate etc. similarly, the back plate layer 5 of the silver connected to the dielectric layer 4 or a carbon resin system, an epoxy resin, and polyester resin It is the same as that of the case of a Prior art that printing formation is carried out in piles one by one, and EL element 13 is constituted.
[0019] Moreover, although it is the same as that of the case of a Prior art that EL element 13 drives and emits light and this light

illuminates a display panel, LCD, etc. of electronic equipment from back if electronic equipment is equipped with this EL element 13 and an electrical potential difference is impressed between the light transmission nature electrode layer 12 of EL element 13, and the back plate layer 5 The light transmission nature electrode layer 12 is formed by printing this conductive paste, using the fluororubber containing the mixed resin of a hygroscopic small phenoxy resin or phenoxy resin, and a hygroscopic epoxy resin, or polyvinylidene fluoride as light transmission nature resin.

[0020] The concrete manufacture approach and property of the above EL elements are explained. First, after having printed each conductive paste by the gestalt of this operation shown in (Table 1), and the conventional conductive paste for a comparison on the 350-mesh stainless steel screen with the predetermined pattern, drying them for 30 minutes at 155 degrees C and forming the light transmission nature electrode layer 12 on the polyethylene terephthalate (PET) film of 0.1mm of stock thickness, the following printings were performed in piles one by one on this.

[0021]

[Table 1]

	ペースト配合成分	wt%
実施例1	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	21.4
	硬化剤（京都エレックス社製 G8009B）	2.1
	導電粉（住友金属鉱山株式会社製 SCP－X）	44.6
	イソホロン	31.9
実施例2	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	19.6
	エポキシ樹脂（油化シェル株式会社製 #828）	3.2
	硬化剤（京都エレックス社製 G8009B）	2.9
	導電粉（住友金属鉱山株式会社製 SCP－X）	45.3
	イソホロン	29.0
実施例3	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	10.8
	エポキシ樹脂（油化シェル株式会社製 #828）	10.9
	硬化剤（京都エレックス社製 G8009B）	3.7
	導電粉（住友金属鉱山株式会社製 SCP－X）	45.8
	イソホロン	28.8
実施例4	フッ素ゴム（デュポン社製 GLT）	16.6
	硬化剤（ｼﾞｸﾐﾙﾊﾞｰｵｷｻｲﾄﾞ）	3.2
	導電粉(住友金属鉱山株式会社製 SCP－X)	48.3
	2－エトキシエトキシエタノール	31.9
実施例5	フッ素ゴム（ダイキン工業株式会社製ﾀﾞｲｴﾙG-902）	14.8
	硬化剤（ｼﾞｸﾐﾙﾊﾞｰｵｷｻｲﾄﾞ）	2.8
	導電粉(住友金属鉱山株式会社製 SCP－X)	52.6
	2－エトキシエトキシエタノール	29.8
比較例1	熱可塑性アクリル樹脂（三菱レーヨン株式会社製 LR-637）	12.8
	導電粉(住友金属鉱山株式会社製 SCP－X)	45.4
	イソホロン	41.8
比較例2	熱硬化性アクリル樹脂（三菱レーヨン株式会社製 SE-192）	14.5
	導電粉(住友金属鉱山株式会社製 SCP－X)	51.4
	イソホロン	34.1

[0022] The emitter paste which distributed 85 % of the weight (OSRAM SYLVANIA TYPE30) of zinc sulfide fluorescent substances to 15 % of the weight (Du Pont Viton A) of fluororubbers dissolved in 2-ethoxy ethoxy ethanol was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 100 degrees C, and the emitter layer 3 was formed.

[0023] Next, the dielectric paste which distributed 78 % of the weight (BT[by Sakai chemistry incorporated company]- 05) of barium titanate powder to 22 % of the weight (Du Pont Viton A) of fluororubbers dissolved in 2-ethoxy ethoxy ethanol was printed on the 100-mesh stainless steel screen with the predetermined pattern, was dried on the same conditions as the emitter layer 3, and the dielectric layer 4 was formed.

[0024] Then, carbon paste (DW[by Toyobo Co., Ltd.]- 250 H) was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 155 degrees C, and the back plate layer 5 was formed.

[0025] Finally, the insulating resist (XB[by FUJIKURA KASEI CO., LTD.]- 804) was printed on the 200-mesh stainless steel screen with the predetermined pattern, was dried for 30 minutes at 155 degrees C, and the insulating layer 6 was formed.

[0026] Under the high humidity environment of 40-degree-C95%RH, 500 hours and after leaving it for 1000 hours, change of the sheet resistance (kohm/**) of a light transmission nature electrode layer and the brightness (Cd/m2) in 100V400Hz was evaluated for the EL element by the gestalt of this operation manufactured as mentioned above, and the conventional EL element for a comparison.

[0027] The result of this characterization is explained using (Table 2).

[0028]

[Table 2]

	初期		500時間後		1000時間後	
	輝度	シート抵抗値	輝度	シート抵抗値	輝度	シート抵抗値
実施例1	69.8	0.68	52.3	1.36	41.5	1.45
実施例2	66.9	0.39	51.6	1.69	40.9	2.12
実施例3	69.2	0.34	52.1	1.95	40.1	2.36
実施例4	65.7	1.92	49.2	2.35	38.5	2.46
実施例5	68.4	2.52	48.6	3.47	37.7	3.49
比較例1	69.5	0.43	22.7	23.7	発光せず	360
比較例2	67.2	0.45	18.2	49.8	発光せず	768

（シート抵抗値は単位：kΩ／□、輝度は単位：Cd／m²で示す）

[0029] The examples 1 and 2 of a comparison which carried out printing formation a light transmission nature electrode layer, using acrylic resin as light transmission nature resin so that clearly from (Table 2) As opposed to sheet resistance rising, brightness deteriorating and going with the passage of time, and sheet resistance becoming several 100kohms /, and ** in 1000 hours, and stopping emitting light Although brightness is carrying out the abbreviation reduction by half of the examples 1-5 which carried out

printing formation of the light transmission nature electrode layer also after 1000 hours, using phenoxy resin, an epoxy resin, and a fluororubber as light transmission nature resin, sheet resistance is several kohms / **, and what has a few change in resistance by moisture.

[0030] Moreover, the examples 4 and 5 which carried out printing formation of the light transmission nature electrode layer, using inside or a fluororubber as light transmission nature resin show the sheet resistance in which change of sheet resistance was excellent with small 3 premiums also after 1000 hours.

[0031] Thus, according to the gestalt of this operation, even if it does not perform moisture-proof processing of the lamination by the film etc., a cheap EL element with few changes in resistance of the light transmission nature electrode layer by moisture can be obtained.

[0032] (Gestalt 2 of operation) After performing coupling processing of (Table 3) into the light transmission nature electric conduction powder (SCP-X by Sumitomo Metal Mining Co., Ltd.) of the example 2 of the gestalt 1 of operation, the EL element which carried out printing formation of a light transmission nature electrode layer, an emitter layer, a dielectric layer, etc. using the conductive paste of the same combination was manufactured into it, and the same characterization as the gestalt 1 of operation was performed into it.

[0033]

[Table 3]

	カップリング処理
実施例6	シランカップリング剤（信越化学工業株式会社製 KBM-403）2％のアセトン溶液に浸漬した後、120℃で1時間乾燥。
実施例7	チタネートカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄKR 44）2％のメタノール溶液に浸漬した後、120℃で1時間乾燥。
実施例8	アルミニウムカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄAL-M）2％のメタノール溶液に浸漬した後、120℃で1時間乾燥。

[0034] This result is explained using (Table 4).

[0035]

[Table 4]

	初期		500時間後		1000時間後	
	輝度	ｼｰﾄ抵抗値	輝度	ｼｰﾄ抵抗値	輝度	ｼｰﾄ抵抗値
実施例6	66.3	0.56	51.8	0.99	41.2	1.05
実施例7	66.1	0.48	51.4	1.23	40.8	1.26
実施例8	66.6	0.62	50.8	1.33	40.8	1.42

（シート抵抗値は単位：kΩ／□、輝度は単位：Cd／㎡で示す）

[0036] In (Table 2), about 2 times and a change in resistance are sharply improved for the sheet resistance of the example 2 used as about 5 or more times to the first stage in 1000 hours so that clearly from (Table 4).

[0037] Thus, according to the gestalt of this operation, an extensive improvement of a change in resistance can be aimed at by covering light transmission nature electric conduction powder with at least one coupling agent of a silane or titanate, and aluminum.

[0038] In addition, although how to make distribute this light transmission nature electric conduction powder in light transmission nature resin, and carry out printing formation of the light transmission nature electrode layer using this conductive paste was explained after immersing light transmission nature electric conduction powder in the coupling solution and making a coupling agent cover with the above explanation beforehand Even if it adds a coupling agent and carries out printing formation of the light transmission nature electrode layer using this conductive paste into the solution which dissolved the light transmission nature resin which distributed light transmission nature electric conduction powder by the organic solvent, of course, it is possible to make light transmission nature electric conduction powder cover a coupling agent.

[0039] Drawing 2 is the sectional view of the panel switch by the gestalt of operation of the 3rd of this invention, and is set to this drawing. (Gestalt 3 of operation) needlelike to the light transmission nature resin which has flexibility on one side of the insulating film 11 — the light transmission nature electrode layer 12 which the light transmission nature electric conduction powder containing ITO distributed -- It is the same as that of the case of the gestalt 1 of operation that printing formation of the emitter layer 3, a dielectric layer 4, the back plate layer 5, and the insulating layer 6 is carried out in piles one by one, and EL element 13 is constituted.

[0040] and to the insulating film 11 side of the EL element 13 upper part The actuation object 14 which consists of India rubber, insulating resin, etc. of light transmission nature is arranged. To the downward back plate layer 5 side The upper wiring substrate 15 which carried out printing formation of the traveling contact 15B on the inferior surface of tongue of insulating film 15A, The bottom wiring substrate 16 which carried out printing formation of the stationary-contact 16B counters the top face of insulating film 16A through a spacer 17, a switching circuit 18 is constituted, a case 19 covers these and the panel switch 20 is constituted.

[0041] In the above configuration, if an electrical potential difference is impressed between the light transmission nature electrode layer 12 of EL element 13, and the back plate layer 5, EL element 13 drives and emits light, and since control unit 14A of actuation object 14 top face which this light projected from two or more holes of a case 19 is illuminated from an inferior surface of tongue, even when dark in a perimeter, the location of control unit 14A and a display can check clearly.

[0042] Moreover, if press actuation of the control unit 14A of the actuation object 14 is carried out to a lower part, height 14B at the bottom will sag the upper wiring substrate 15 through EL element 13. If electrical installation of traveling contact 15B of the upper wiring substrate 15 and stationary-contact 16B of the bottom wiring substrate 16 is performed and the thrust of the actuation object 14 is removed, it is constituted so that traveling contact 15B may separate from stationary-contact 16B and may return to the OFF condition of drawing 2 according to the elastic return force of the upper wiring substrate 15.

[0043] Thus, according to the gestalt of this operation, the actuation object 14 is arranged to the insulating film 11 side of the EL element 13 upper part, a switching circuit 18 is arranged to the downward back plate layer 5 side, a panel switch 20 is constituted, and since the switching circuit 18 is operated through EL element 13 excellent in flexibility, the panel switch excellent in the operability which does not degrade an actuation feel can be obtained.

[0044] Moreover, if it replaces with the upper wiring substrate 15 which carried out printing formation of the traveling contact 15B and printing formation of the traveling contact is carried out on the inferior surface of tongue of EL element 13, the number of component

parts can be reduced and a still cheaper panel switch can be obtained.
[0045] In addition, although the above explanation explained the switching circuit 18 arranged at the back plate layer 5 side of EL element 13 lower part as the so-called membrane switch which traveling contact 15B of the upper wiring substrate 15 and stationary-contact 16B of the bottom wiring substrate 16 were made to counter The wiring substrate 21 with which stationary contacts 21A and 21B were formed in the top face as shown in drawing 3 , The dome-like traveling contact 22 made from an elastic metallic thin plate laid on stationary-contact 21B of the wiring substrate 21 constitutes a switching circuit 23. By height 14B of actuation object 14 inferior surface of tongue pressing the central top-most-vertices section of the dome-like traveling contact 22 through EL element 13, and the dome-like traveling contact's 22 being reversed, and contacting stationary-contact 21A of the wiring substrate 21 Of course also as a panel switch 24 which performs electric attachment and detachment of stationary contacts 21A and 21B, operation of this invention is possible.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of the EL element by the gestalt of operation of the 1st of this invention
[Drawing 2] The sectional view of the panel switch by the gestalt of operation of the 3rd of this invention
[Drawing 3] The sectional view by the gestalt of operation of ****
[Drawing 4] The sectional view of the conventional EL element
[Description of Notations]
3 Emitter Layer
4 Dielectric Layer
5 Back Plate Layer
6 Insulating Layer
11 Insulating Film
12 Light Transmission Nature Electrode Layer
13 EL Element
14 Actuation Object
14A Control unit
14B Height
15 Upper Wiring Substrate
15A, 16A Insulating film
15B Traveling contact
16 Bottom Wiring Substrate
16B Stationary contact
17 Spacer
18 23 Switching circuit
19 Case
20 24 Panel switch
21 Wiring Substrate
21A, 21B Stationary contact
22 Dome-like Traveling Contact

[Translation done.]

JP,11-273874,A [DRAWINGS]

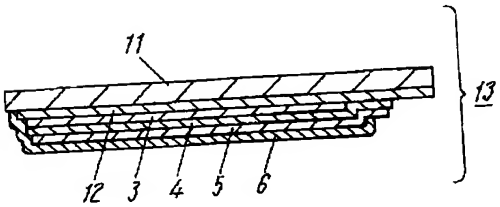
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

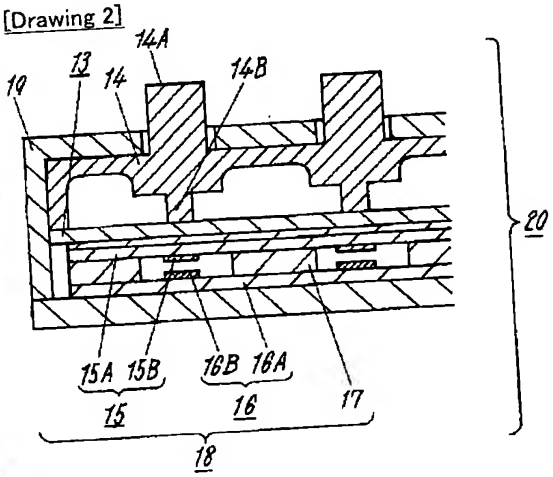
DRAWINGS

[Drawing 1]

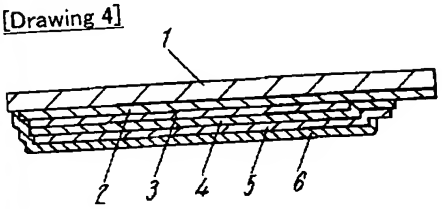
3 発光体層
4 誘電体層
5 背面電極層
6 絶 縁 層
11 絶縁フィルム
12 光透過性電極層
13 EL素子



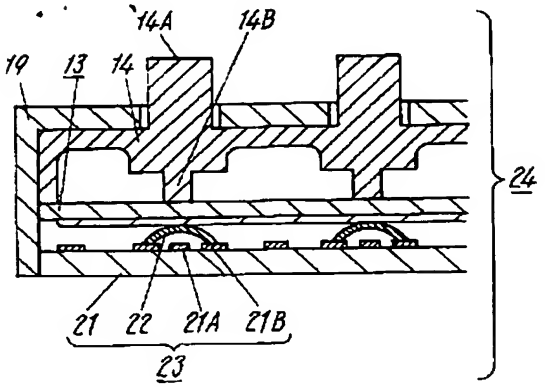
[Drawing 2]



[Drawing 4]



[Drawing 3]



[Translation done.]

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Ｈ０１Ｂ　1/20		Ｈ０１Ｂ　1/20		Ｚ
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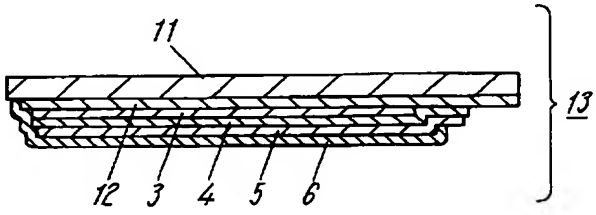
(54)【発明の名称】　光透過性導電材料、これを用いた分散型エレクトロルミネッセンス素子及びパネルスイッチ

(57)【要約】

【課題】　各種電子機器の表示部や操作部にバックライト等として使用されるＥＬ素子に関し、防湿加工が不要で、湿気による光透過性電極層の抵抗値変化の少ない、安価なＥＬ素子を提供することを目的とする。

【解決手段】　酸化インジウム錫の針状結晶粉を含む光透過性導電粉を分散した光透過性樹脂を、吸湿性の小さなフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂、或いはポリフッ化ビニリデンを含有するフッ素ゴムとし、これを用いて光透過性電極層１２を絶縁フィルム１１に印刷形成し、この上に発光体層３や誘電体層４等を順次重ねて印刷形成することによって、防湿加工が不要で、湿気による光透過性電極層の抵抗値変化の少ない、安価なＥＬ素子を得ることができる。

3 発光体層
4 誘電体層
5 背面電極層
6 絶縁層
11 絶縁フィルム
12 光透過性電極層
13 ＥＬ素子



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【特許請求の範囲】

【請求項１】　光透過性の絶縁フィルムと、この絶縁フィルム片面の全面或いは所定の箇所に、光透過性導電粉を分散した光透過性樹脂によって印刷形成された光透過性電極層と、光透過性電極層上に順次重ねて印刷形成された発光体層及び誘電体層、背面電極層からなり、光透過性電極層の光透過性導電粉が酸化インジウム錫の針状結晶粉を含むと共に、光透過性樹脂の主成分をフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂とした分散型エレクトロルミネッセンス素子。

【請求項２】　光透過性電極層の光透過性樹脂を請求項１記載の光透過性樹脂に代えて、ポリフッ化ビニリデンを含有するフッ素ゴムとした分散型エレクトロルミネッセンス素子。

【請求項３】　光透過性電極層の光透過性導電粉を、シランまたはチタネート、アルミニウムの少なくとも一つのカップリング剤で被覆した請求項１または２記載の分散型エレクトロルミネッセンス素子。

【請求項４】　フェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂或いはポリフッ化ビニリデンを含有するフッ素ゴムを主成分とした光透過性樹脂に、針状結晶の酸化インジウム錫を光透過性導電粉として分散した光透過性導電材料。

【請求項５】　請求項１～３のいずれか一つに記載の分散型エレクトロルミネッセンス素子を、絶縁フィルム側を上面に背面電極層側を下面に配置すると共に、その上方に操作体を下方にスイッチ回路を配置し、操作体を押圧することによって、上記素子を介してスイッチ回路の電気的接離を行うパネルスイッチ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、各種電子機器の表示部や操作部にバックライト等として使用される光透過性導電材料とこれを用いた分散型エレクトロルミネッセンス素子（以下、ＥＬ素子と記載する）及びパネルスイッチに関するものである。

【０００２】

【従来の技術】近年、各種電子機器の多様化が進むにつれて、暗闇でも表示部の識別や操作が可能なように表示パネルやＬＣＤの後方に照光用のバックライトを備えたものが増え、そのバックライト用としてＥＬ素子が多く使用されるようになってきた。

【０００３】このような従来のＥＬ素子について、図４を用いて説明する。図４は従来のＥＬ素子の断面図であり、同図において、１はポリエチレンテレフタレート等の可撓性を有する透明な絶縁フィルムで、この片面全面にスパッタ法または電子ビーム法により酸化インジウム錫（以下、ＩＴＯと記載する）からなる光透過性電極層２が形成され、さらにこの上に、フッ素ゴムやシアノ系樹脂等の高誘電性樹脂に発光の母材となる硫化亜鉛を分

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散させた発光体層３や、同じく高誘電性樹脂にチタン酸バリウム等を分散させた誘電体層４、誘電体層４に接続された銀やカーボンレジン系の背面電極層５、エポキシ樹脂やポリエステル樹脂等の絶縁層６が順次重ねて印刷形成され、ＥＬ素子が構成されている。

【０００４】以上のような構成のＥＬ素子を電子機器に装着し、電子機器の回路（図示せず）からＥＬ素子の光透過性電極層２と背面電極層５の間に電圧を印加すると、ＥＬ素子が駆動して発光し、この光が電子機器の表示パネルやＬＣＤ等を後方から照光するため、周囲が暗い場合でも表示部や操作部の識別を明確に行うことができるものである。

【０００５】

【発明が解決しようとする課題】しかしながら上記従来のＥＬ素子においては、ＩＴＯ金属粉からなる光透過性電極層２がスパッタ法や電子ビーム法によって絶縁フィルム１の片面全面に形成されているため、この加工に時間を要しコスト高になると共に、高湿度中で発光させ続けると光透過性電極層２に電界腐食が生じ、部分的に発光しない箇所が発生するという課題があった。

【０００６】また、他の光透過性電極層の形成方法として、例えば特開平８－７８１６４号公報に開示されているように、光透過性樹脂に光透過性導電粉を分散し、この導電ペーストを絶縁フィルムにスクリーン印刷して光透過性電極層を形成することが行われているが、光透過性電極層の高湿度環境下におけるシート抵抗値の上昇を防ぐため、ＥＬ素子をフッ素フィルムで包んでラミネートする等の防湿のための加工を施す必要があった。

【０００７】そして、この光透過性樹脂を用いた光透過性電極層の湿度による抵抗値上昇は、湿気により光透過性樹脂が吸湿膨潤することと、光透過性導電粉が表面に水酸基を多量に有しているため、一旦水分子を吸着すると高温にして乾燥しない限り徐々に水分子の吸着量が増えることによって、光透過性樹脂内に分散された光透過性導電粉同士の接触が緩み接触抵抗が増加することが原因であるが、スパッタ法や電子ビーム法に比べ安価な印刷によって光透過性電極層を形成しているにも関わらず、上記のような防湿加工を行う必要があるため、これに時間を要しコスト高になってしまうという課題があった。

【０００８】本発明は、このような従来の課題を解決するものであり、湿気による光透過性電極層の抵抗値変化の少ない光透過性導電材料と、防湿加工が不要で、安価なＥＬ素子及びパネルスイッチを提供することを目的とする。

【０００９】

【課題を解決するための手段】上記課題を解決するために本発明は、酸化インジウム錫の針状結晶粉を含む光透過性導電粉を分散した光透過性樹脂を、吸湿性の小さなフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の

混合樹脂、或いはポリフッ化ビニリデンを含有するフッ素ゴムとしたものであり、これを用いて光透過性電極層を印刷形成するものである。

【００１０】これにより、湿気による光透過性電極層の抵抗値変化の少ない光透過性導電材料と、防湿加工が不要で、安価なＥＬ素子及びパネルスイッチを得ることができる。

【００１１】

【発明の実施の形態】本発明の請求項１に記載の発明は、光透過性の絶縁フィルムと、この絶縁フィルム片面の全面或いは所定の箇所に、光透過性導電粉を分散した光透過性樹脂によって印刷形成された光透過性電極層と、光透過性電極層上に順次重ねて印刷形成された発光体層及び誘電体層、背面電極層からなり、光透過性電極層の光透過性導電粉が酸化インジウム錫の針状結晶粉を含むと共に、光透過性樹脂の主成分をフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂とした分散型エレクトロルミネッセンス素子としたものであり、樹脂によって光透過性電極層が印刷形成されているため、可撓性を有するＥＬ素子が得られると共に、光透過性樹脂を吸湿性の小さなフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂とし、これを用いて光透過性電極層を印刷形成することによって、防湿加工が不要で、湿気による光透過性電極層の抵抗値変化の少ない、安価なＥＬ素子を得ることができるという作用を有する。

【００１２】請求項２に記載の発明は、光透過性電極層の光透過性樹脂を請求項１記載の光透過性樹脂に代えて、ポリフッ化ビニリデンを含有するフッ素ゴムとしたものであり、吸湿性がさらに小さなポリフッ化ビニリデンを光透過性樹脂として用いることで、湿気による光透過性電極層の抵抗値変化がさらに少ないＥＬ素子が得られるという作用を有する。

【００１３】請求項３に記載の発明は、請求項１または２記載の発明において、光透過性電極層の光透過性導電粉を、シランまたはチタネート、アルミニウムの少なくとも一つのカップリング剤で被覆したものであり、これらのカップリング剤によって光透過性導電粉への水分子の吸着が減少するため、湿気による光透過性電極層の抵抗値変化がより少ないＥＬ素子が得られるという作用を有する。

【００１４】請求項４に記載の発明は、フェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂或いはポリフッ化ビニリデンを含有するフッ素ゴムを主成分とした光透過性樹脂に、針状結晶の酸化インジウム錫を光透過性導電粉として分散した光透過性導電材料としたものであり、光透過性樹脂の主成分を吸湿性の小さなフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂、或いは吸湿性がさらに小さなポリフッ化ビニリデンを含有するフッ素ゴムとすることによって、湿気による抵抗値変化の少ない光透過性導電材料を得ることができるという作用を有する。

【００１５】請求項５に記載の発明は、請求項１～３のいずれか一つに記載の分散型エレクトロルミネッセンス素子を、絶縁フィルム側を上面に背面電極層側を下面に配置すると共に、その上方に操作体を下方にスイッチ回路を配置し、操作体を押圧することによって、上記素子を介してスイッチ回路の電気的接離を行うパネルスイッチとしたものであり、可撓性に優れたＥＬ素子を用い、これを介してスイッチ回路の動作を行っているため、操作性に優れたパネルスイッチを得ることができるという作用を有する。

【００１６】以下、本発明の実施の形態について、図１～図３を用いて説明する。なお、従来の技術の項で説明した構成と同一構成の部分には同一符号を付して、詳細な説明を省略する。

【００１７】（実施の形態１）図１は本発明の第１の実施の形態によるＥＬ素子の断面図であり、同図において、１１はポリエチレンテレフタレートやポリイミド、ポリサルフォン、ポリカーボネート等の可撓性を有する透明な絶縁フィルムで、この片面に可撓性を有する光透過性樹脂に針状ＩＴＯを含む光透過性導電粉が分散した導電ペーストを印刷して、光透過性電極層１２が形成されている。

【００１８】そして、この光透過性電極層１２の上に、フッ素ゴムやシアノ系樹脂等の高誘電性樹脂に発光の母材となる硫化亜鉛を分散させた発光体層３や、同じく高誘電性樹脂にチタン酸バリウム等を分散させた誘電体層４、誘電体層４に接続された銀やカーボンレジン系の背面電極層５、エポキシ樹脂やポリエステル樹脂等の絶縁層６が、順次重ねて印刷形成されＥＬ素子１３が構成されていることは従来の技術の場合と同様である。

【００１９】また、このＥＬ素子１３を電子機器に装着し、ＥＬ素子１３の光透過性電極層１２と背面電極層５の間に電圧を印加すると、ＥＬ素子１３は駆動して発光し、この光が電子機器の表示パネルやＬＣＤ等を後方から照光することも従来の技術の場合と同様であるが、光透過性電極層１２は、吸湿性の小さなフェノキシ樹脂またはフェノキシ樹脂とエポキシ樹脂の混合樹脂、或いはポリフッ化ビニリデンを含有するフッ素ゴムを光透過性樹脂として用い、この導電ペーストを印刷することによって形成されている。

【００２０】以上のようなＥＬ素子の具体的な製作方法と、その特性について説明する。先ず、材厚０．１ｍｍのポリエチレンテレフタレート（ＰＥＴ）フィルム上に、（表１）に示す本実施の形態による各導電ペースト及び比較用の従来の導電ペーストを、所定のパターンで３５０メッシュステンレススクリーンで印刷し、１５５℃で３０分間乾燥して光透過性電極層１２を形成した後、この上に順次重ねて以下の印刷を行った。

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【００２１】

【表１】

	ペースト配合成分	ｗｔ％
実施例１	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	２１．４
	硬化剤（京都エレックス社製　G8009B）	２．１
	導電粉（住友金属鉱山株式会社製 SCP－X）	４４．６
	イソホロン	３１．９
実施例２	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	１９．６
	エポキシ樹脂（油化シェル株式会社製　#828）	３．２
	硬化剤（京都エレックス社製　G8009B）	２．９
	導電粉（住友金属鉱山株式会社製 SCP－X）	４５．３
	イソホロン	２９．０
実施例３	フェノキシ樹脂（東都化成株式会社製 ﾌｪﾉﾄｰﾄYP-50）	１０．８
	エポキシ樹脂（油化シェル株式会社製　#828）	１０．９
	硬化剤（京都エレックス社製　G8009B）	３．７
	導電粉（住友金属鉱山株式会社製 SCP－X）	４５．８
	イソホロン	２８．８
実施例４	フッ素ゴム（デュポン社製 GLT）	１６．６
	硬化剤（ｼﾞｸﾐﾙﾊﾞｰｵｷｻｲﾄﾞ）	３．２
	導電粉(住友金属鉱山株式会社製 SCP－X)	４８．３
	２－エトキシエトキシエタノール	３１．９
実施例５	フッ素ゴム（ダイキン工業株式会社製ﾀﾞｲｴﾙG-902）	１４．８
	硬化剤（ｼﾞｸﾐﾙﾊﾞｰｵｷｻｲﾄﾞ）	２．８
	導電粉(住友金属鉱山株式会社製 SCP－X)	５２．６
	２－エトキシエトキシエタノール	２９．８
比較例１	熱可塑性アクリル樹脂（三菱レーヨン株式会社製 LR-637）	１２．８
	導電粉(住友金属鉱山株式会社製 SCP－X)	４５．４
	イソホロン	４１．８
比較例２	熱硬化性アクリル樹脂（三菱レーヨン株式会社製 SE-192）	１４．５
	導電粉(住友金属鉱山株式会社製 SCP－X)	５１．４
	イソホロン	３４．１

【００２２】硫化亜鉛蛍光体（オスラムシルバニア社製ＴＹＰＥ３０）８５重量％を、２－エトキシエトキシエタノールに溶解したフッ素ゴム（デュポン社製バイトンＡ）１５重量％に分散した発光体ペーストを、所定パターンで２００メッシュステンレススクリーンで印刷し、１００℃で３０分間乾燥して発光体層３を形成した。

【００２３】次に、チタン酸バリウム粉末（堺化学株式会社製ＢＴ－０５）７８重量％を、２－エトキシエトキシエタノールに溶解したフッ素ゴム（デュポン社製バイトンＡ）２２重量％に分散した誘電体ペーストを、所定パターンで１００メッシュステンレススクリーンで印刷し、発光体層３と同一条件で乾燥して誘電体層４を形成した。

【００２４】続いて、カーボンペースト（東洋紡株式会社製ＤＷ－２５０Ｈ）を、所定パターンで２００メッシュステンレススクリーンで印刷し、１５５℃で３０分間＊乾燥して背面電極層５を形成した。

【００２５】最後に、絶縁レジスト（藤倉化成株式会社製ＸＢ－８０４）を、所定パターンで２００メッシュステンレススクリーンで印刷し、１５５℃で３０分間乾燥して絶縁層６を形成した。

【００２６】以上のように製作した本実施の形態によるＥＬ素子と比較用の従来のＥＬ素子を、４０℃９５％ＲＨの高湿度環境下に５００時間及び１０００時間放置した後、光透過性電極層のシート抵抗値（ｋΩ／□）及び１００Ｖ４００Ｈｚでの輝度（Ｃｄ／ｍ²）の変化を評価した。

【００２７】この特性評価の結果について、（表２）を用いて説明する。

【００２８】

【表２】

	初期		５００時間後		１０００時間後	
	輝度	ｼｰﾄ抵抗値	輝度	ｼｰﾄ抵抗値	輝度	ｼｰﾄ抵抗値
実施例１	６９．８	０．６８	５２．３	１．３６	４１．６	１．４５
実施例２	６６．９	０．３９	５１．６	１．６９	４０．９	２．１２
実施例３	６９．２	０．３４	５２．１	１．９５	４０．１	２．３６
実施例４	６５．７	１．９２	４９．２	２．３５	３８．５	２．４６
実施例５	６８．４	２．５２	４８．６	３．４７	３７．７	３．４９
比較例１	６９．５	０．４３	２２．７	２３．７	発光せず	３６０
比較例２	６７．２	０．４５	１８．２	４９．８	発光せず	７６８

（シート抵抗値は単位：ｋΩ／□，輝度は単位：Ｃｄ／㎡で示す）

【００２９】（表２）から明らかなように、アクリル樹脂を光透過性樹脂として用いて光透過性電極層を印刷形成した比較例１，２が、時間の経過と共にシート抵抗値が上昇し輝度が劣化して行き、１０００時間ではシート抵抗値が数百ｋΩ／□となって発光しなくなるのに対し、フェノキシ樹脂やエポキシ樹脂、フッ素ゴムを光透過性樹脂として用いて光透過性電極層を印刷形成した実施例１～５は、１０００時間後でも輝度は約半減しているもののシート抵抗値が数ｋΩ／□と、湿気による抵抗値変化の少ないものとなっている。

【００３０】また、中でもフッ素ゴムを光透過性樹脂として用いて光透過性電極層を印刷形成した実施例４，５

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は、シート抵抗値の変化が１０００時間後でも僅か３割増しと、優れたシート抵抗値を示している。

【００３１】このように本実施の形態によれば、フィルムによるラミネート等の防湿加工を行わなくとも、湿気による光透過性電極層の抵抗値変化の少ない、安価なＥＬ素子を得ることができるものである。

【００３２】（実施の形態２）実施の形態１の実施例２＊

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＊の光透過性導電粉（住友金属鉱山株式会社製ＳＣＰ－Ｘ）に、（表３）のカップリング処理を行った後、同じ配合の導電ペーストを用いて光透過性電極層や発光体層、誘電体層等を印刷形成したＥＬ素子を製作し、実施の形態１と同様の特性評価を行った。

【００３３】

【表３】

	カップリング処理
実施例６	シランカップリング剤（信越化学工業株式会社製 KBM-403）２％のアセトン溶液に浸漬した後、１２０℃で１時間乾燥。
実施例７	チタネートカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄKR 44）２％のメタノール溶液に浸漬した後、１２０℃で１時間乾燥。
実施例８	アルミニウムカップリング剤（味の素株式会社製ﾌﾟﾚﾝｱｸﾄAL-M）２％のメタノール溶液に浸漬した後、１２０℃で１時間乾燥。

【００３４】この結果について、（表４）を用いて説明する。

※【００３５】

※【表４】

	初期		５００時間後		１０００時間後	
	輝度	シート抵抗値	輝度	シート抵抗値	輝度	シート抵抗値
実施例６	６６．３	０．５６	５１．８	０．９９	４１．２	１．０５
実施例７	６６．１	０．４８	５１．４	１．２３	４０．８	１．２６
実施例８	６６．６	０．６２	５０．８	１．３３	４０．８	１．４２

（シート抵抗値は単位：ｋΩ／□、輝度は単位：Ｃｄ／㎡で示す）

【００３６】（表４）から明らかなように、（表２）では初期に対し１０００時間では約５倍以上となっていた実施例２のシート抵抗値が、２倍程度と抵抗値変化が大幅に改善されている。

【００３７】このように本実施の形態によれば、光透過性導電粉をシランまたはチタネート、アルミニウムの少なくとも一つのカップリング剤で被覆することによって、抵抗値変化の大幅な改善を図ることができるものである。

【００３８】なお、以上の説明では、光透過性導電粉をカップリング溶液に浸漬し、あらかじめカップリング剤を被覆させた後、この光透過性導電粉を光透過性樹脂中に分散させ、この導電ペーストを用いて光透過性電極層を印刷形成する方法について説明したが、光透過性導電粉を分散した光透過性樹脂を有機溶剤で溶解した溶液の中に、カップリング剤を添加して、この導電ペーストを用いて光透過性電極層を印刷形成しても、光透過性導電粉にカップリング剤を被覆させることが可能なことは勿論である。

【００３９】（実施の形態３）図２は本発明の第３の実施の形態によるパネルスイッチの断面図であり、同図において、絶縁フィルム１１の片面に可撓性を有する光透過性樹脂に針状ＩＴＯを含む光透過性導電粉が分散した光透過性電極層１２や、発光体層３、誘電体層４、背面電極層５、絶縁層６が順次重ねて印刷形成され、ＥＬ素子１３が構成されていることは実施の形態１の場合と同様である。

【００４０】そして、ＥＬ素子１３上方の絶縁フィルム１１側には、光透過性の弾性ゴムや絶縁樹脂等からなる操作体１４が配置され、下方の背面電極層５側には、絶縁フィルム１５Ａの下面に可動接点１５Ｂを印刷形成した上配線基板１５と、絶縁フィルム１６Ａの上面に固定接点１６Ｂを印刷形成した下配線基板１６が、スペーサ１７を介して対向してスイッチ回路１８が構成され、これらをケース１９が覆ってパネルスイッチ２０が構成されている。

【００４１】以上の構成において、ＥＬ素子１３の光透過性電極層１２と背面電極層５の間に電圧を印加すると、ＥＬ素子１３が駆動して発光し、この光がケース１９の複数の孔から突出した操作体１４上面の操作部１４Ａを下面から照光するため、周囲が暗い場合でも操作部１４Ａの位置や表示が明確に確認できるものである。

【００４２】また、操作体１４の操作部１４Ａを下方へ押圧操作すると、下面の突起部１４ＢがＥＬ素子１３を介して上配線基板１５を撓ませて、上配線基板１５の可動接点１５Ｂと下配線基板１６の固定接点１６Ｂの電気的接続が行われ、操作体１４の押圧力を除去すると、上配線基板１５の弾性復帰力によって可動接点１５Ｂが固定接点１６Ｂから離れ図２のＯＦＦ状態に復帰するように構成されている。

【００４３】このように本実施の形態によれば、ＥＬ素子１３上方の絶縁フィルム１１側に操作体１４を配置し、下方の背面電極層５側にスイッチ回路１８を配置してパネルスイッチ２０を構成し、可撓性に優れたＥＬ素子１３を介してスイッチ回路１８の動作を行っているため、操作感触を劣化させることのない操作性に優れたパネルスイッチを得ることができるものである。

【００４４】また、可動接点１５Ｂを印刷形成した上配線基板１５に代えて、ＥＬ素子１３の下面に可動接点を印刷形成すれば、構成部品数を減らし、さらに安価なパ

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ネルスイッチを得ることができる。

【００４５】なお、以上の説明では、ＥＬ素子１３下方の背面電極層５側に配置されたスイッチ回路１８を、上配線基板１５の可動接点１５Ｂと下配線基板１６の固定接点１６Ｂを対向させたいわゆるメンブレンスイッチとして説明したが、図３に示すように、上面に固定接点２１Ａ，２１Ｂが形成された配線基板２１と、配線基板２１の固定接点２１Ｂ上に載置された弾性金属薄板製のドーム状可動接点２２によってスイッチ回路２３を構成し、操作体１４下面の突起部１４ＢがＥＬ素子１３を介してドーム状可動接点２２の中央頂点部を押圧し、ドーム状可動接点２２が反転して配線基板２１の固定接点２１Ａに接触することによって、固定接点２１Ａと２１Ｂの電気的接離を行うようなパネルスイッチ２４としても、本発明の実施が可能なことは勿論である。

【００４６】

【発明の効果】以上のように本発明によれば、湿気による光透過性電極層の抵抗値変化の少ない光透過性導電材料と、防湿加工が不要で、安価なＥＬ素子及びパネルスイッチを得ることができるという有利な効果が得られる。

【図面の簡単な説明】

【図１】本発明の第１の実施の形態によるＥＬ素子の断面図

【図２】本発明の第３の実施の形態によるパネルスイッチの断面図

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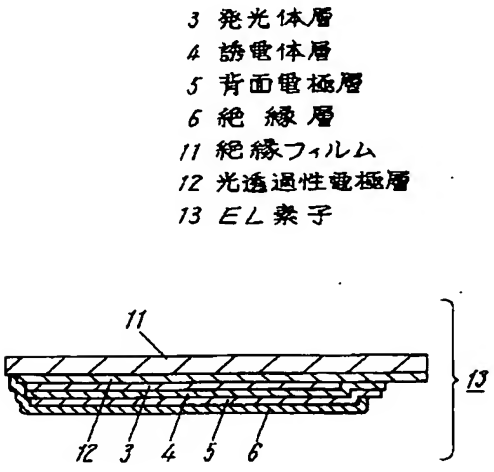
【図３】同他の実施の形態による断面図

【図４】従来のＥＬ素子の断面図

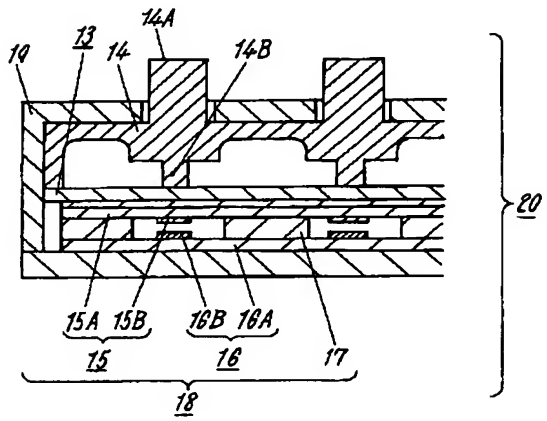
【符号の説明】

３　発光体層
４　誘電体層
５　背面電極層
６　絶縁層
１１　絶縁フィルム
１２　光透過性電極層
１３　ＥＬ素子
１４　操作体
１４Ａ　操作部
１４Ｂ　突起部
１５　上配線基板
１５Ａ，１６Ａ　絶縁フィルム
１５Ｂ　可動接点
１６　下配線基板
１６Ｂ　固定接点
１７　スペーサ
１８，２３　スイッチ回路
１９　ケース
２０，２４　パネルスイッチ
２１　配線基板
２１Ａ，２１Ｂ　固定接点
２２　ドーム状可動接点

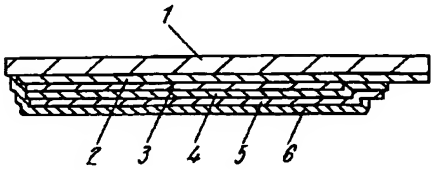
【図１】



【図２】



【図４】



【図３】